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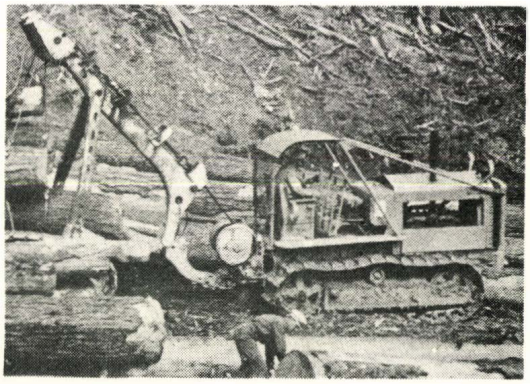
NORTHEASTERN LOGGERS' HANDBOOK

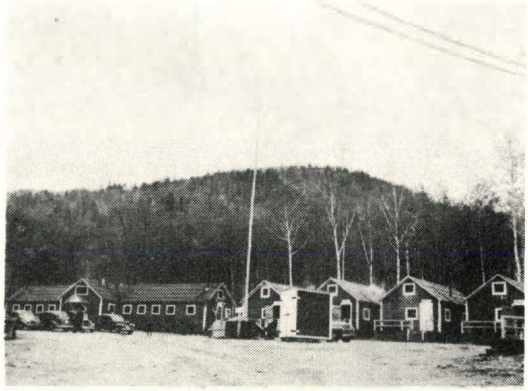
by

Fred C. Simmons

PRELIMINARY REVIEW EDITION



Easier and Safer Work



Greater Production (more pay) and Better Living Conditions

SECTION 16:—LOGGING TRUCKS

NORTHEASTERN FOREST
EXPERIMENT STATION

United States Department of Agriculture

FOREST SERVICE
NORTHEASTERN FOREST EXPERIMENT STATION

614 Bankers Securities Building
Philadelphia 7, Pennsylvania

V. L. HARPER, DIRECTOR

FOREST UTILIZATION SERVICE
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If you want to be a mechanic, you will easily find plenty of good books which will tell you what you need to know. You will also find plenty of instructors and training shops.

What about the young man who wants to make his living by logging? For him there is no good source of information to which he can turn. The books and courses on logging are for the logging engineers--not for the fellow who uses the axe and crosscut.

Why shouldn't there be a simple illustrated handbook which will tell the young woodsman (or the green woodsman) what he needs to know about the care and use of his tools and the best of the old and the new techniques of, and devices for logging? He needs to know the "tricks of the trade" as much as anyone.

We hope that these pages, together with other short papers like it, will finally be put together in a printed NORTHEASTERN LOGGERS' HANDBOOK. We are putting it out in this form first because there seems to be an urgent need for this sort of information; and because we need the help and advice of persons who know about logging in our region before printing. We want the experienced logger to tell us what important things we have missed and where our advice is not good. We want the young man going into the woods for the first time to tell us what parts of it he finds hard to understand, to suggest how it can be made more useful to him. We would like the equipment manufacturers to check our recommendations for use of their products and tell us about new devices they are developing.

Please send criticisms, questions and suggestions to: The Director, Northeastern Forest Experiment Station, 614 Bankers Securities Building, Philadelphia 7, Pa. Additional copies of this and other publications in this series can be obtained from the same address.

1947

LOGGING TRUCKS

by Fred C. Simmons*

The standard gasoline-powered motor truck is now, and probably will continue to be, the favorite tool for hauling timber products out of the Northeastern woods. The motor truck has been so improved that it is now giving service that would have been thought impossible a few years ago. Tandem rear axles, 4- and 6-wheel drives, air and vacuum brakes, and sturdier all-around construction have made it possible for even the lightest makes to carry loads of 3 to 4 cords, or 3 to 4 thousand board feet.

Size of Truck

Most of the trucks used for hauling timber products in the Northeast are in the 1 1/2- and 2-ton class; a few in the 3-ton class. Many of the state and township roads in the wooded areas are narrow and crooked, with bridges that will not carry heavy loads. This is one reason why the big diesel-powered trucks used in Western logging have not been favored in the Northeast.

* Specialist in logging and primary processing.

The smaller standard truck units probably will remain popular in this section of the country. The extensive public-road system favors them, and so does the type of timber. Scattered small-size timber in the Northeast makes for long loading time. The large trucks have a high fixed cost for the time they are not rolling. The smaller truck has a lower fixed cost. The smaller truck has a high volume-unit-mile cost when it is traveling, but the more miles per hour it can make, the more this high cost is cut down.

Here is the way it works:

	Gasoline-powered 1 1/2-ton truck	Diesel-powered 6-ton truck
Average load	3 M bd. ft.	10 M bd. ft.
Fixed cost per minute	$0.04	$ 0.12
Operating cost per hour	$6.00	$14.00

Case No. 1 (Typical of western conditions)
(Loading time, 5 minutes per M board feet;
30-mile round trip at 15 mph. average) :

	Total	Per M	Total	Per M
Loading cost	$ .60	$ .20	$ 6.00	$ .60
Trip cost	12.00	4.00	28.00	2.80
Total	$12.60	$4.20	$34.00	$3.40

Case No. 2 (Typical of northeastern conditions)
(Loading time, 15 minutes per M. board feet;
30-mile round trip at 30 mph. average) :

Loading cost	$1.80	$ .60	$18.00	$1.80
Trip cost	6.00	2.00	14.00	1.40
Total	$7.80	$2.60	$32.00	$3.20

On most Northeastern jobs the wood is carried on the vehicle itself. Usually it is cut into short lengths before loading. Many states limit the length of the load as well as the width of vehicles that are allowed to travel on public roads. Some states also require an independent braking system for trailers used on commercial vehicles. This has forced off the roads some of the haywire trailer contractions formerly used. (Trailer brakes are necessary to prevent jack-knifing

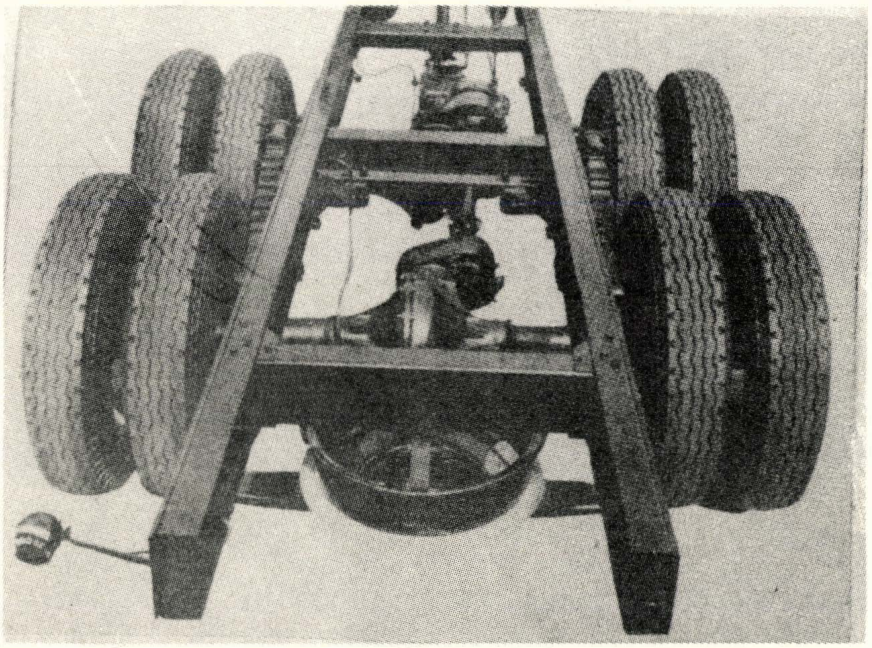
on slippery roads.) Even where there are no such regulations, the roads themselves often force loggers to use shorter, more maneuverable, self-contained vehicles. Improvements in the roads and in small logging trailers, and the tendency toward more tree-length logging, may reverse this trend.

Tandem Axles

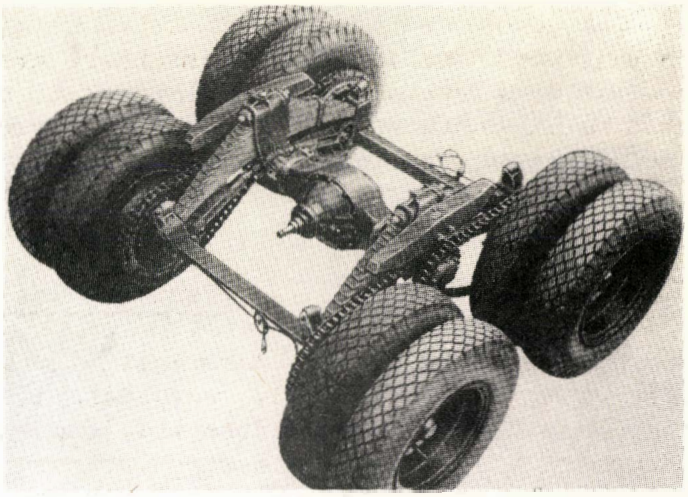
Despite their relatively high cost, the use of tandem rear axles on logging trucks is steadily increasing in the Northeast. Dual wheels have long been used to reduce the load on the individual tire. The tandem axle carries this a step further. On many trucks the tandem axle is merely mounted on helper springs behind the original axle; it takes part of the load off the original springs, axles, and tires.

More and more Northeastern loggers are installing dual axles that transmit power to all four sets of rear wheels. This gives a more even distribution of tractive power as well as of weight. Ordinarily the truck frame is strengthened and stronger springs are put on when such tandem axles are installed. With such rigs the safe-hauling capacity of the truck is practically doubled.

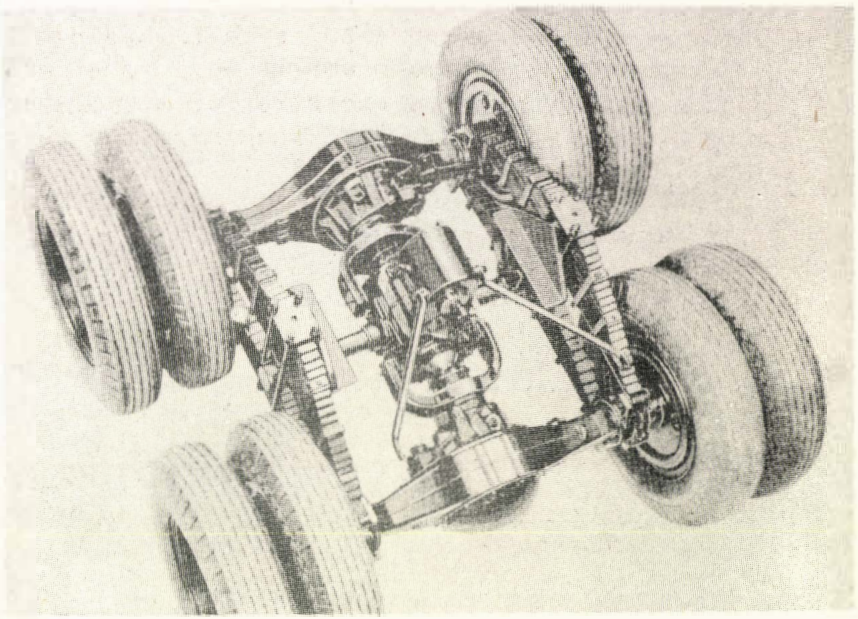
Three general types of powered tandem axles are in use. In the first, the drive shaft in front of the original axle is cut, and a gearbox is installed above the old differential. From this a shaft, with universal joints, transmits the power to the differential of the added axle.



In the second type there is a single differential. The power is transmitted to all four sets of wheels by roller chains



The third type has a new automatic locking differential placed between the two axles. It takes power from the drive shaft, and through universal jointed shafts transmits it to the differentials of the two standard axles. If automatic locking differentials are also installed in the two truck axles, power is transmitted to all four sets of wheels whenever it is applied from the motor. This is a big advantage in logging: even if only one of the dual wheels is on a surface when it can get a grip, the truck can be moved.



All of these dual-axle devices are mounted on walking-beam type springs, which give considerable flexibility to the whole rear-end assembly.

Front-wheel Drives

Front-wheel drives have never been popular with Northeastern loggers because experience has indicated that they are much harder on the driver. Now, however, many army trucks, with tandem rear axles and front-wheel drive also, are being bought at surplus-property sales and are finding their way into the woods. Some loggers are finding that the extra power under the front end is well worth while, particularly when the truck is used as a tractor to pull a trailer or a train of sleds in winter logging. However, there are some disadvantages with these military trucks. Many loggers are finding that the

the differential on the front axle reduces the clearance, and for this reason these trucks cannot be used in the woods as standard trucks have been used in the past. These army trucks also often use excessive amounts of gasoline. For carrying full loads of logs or wood on the truckbed, the wheelbases of most army trucks need to be lengthened.

Cab-over-Engine Trucks

Cab-over-engine trucks provide more load space on the same wheelbase, but they are not generally favored for logging. The cab itself is usually small, difficult to get into and out of; and the engine is usually more difficult to work on. Moreover, a large part of the weight of the load is borne by the front axle; and this makes the truck harder to steer.

Truck Bodies

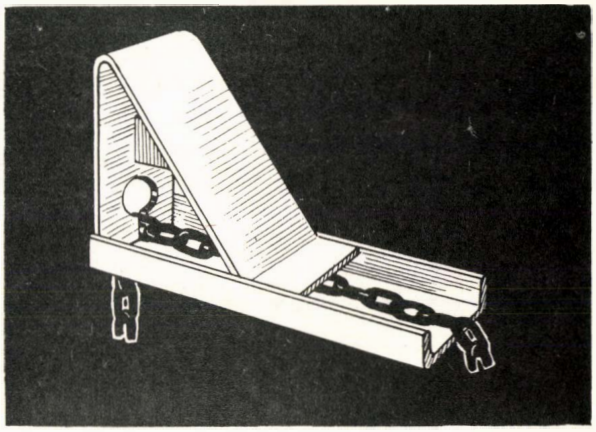
The ordinary stake-body truck is used to carry much wood on Northeastern jobs. This is particularly true of pulpwood, most of which is cut into 4-foot lengths before hauling. Because of state highway restrictions, which limit the over-all width of the truck to 8 feet, the wood must be piled lengthwise if a full load is to be carried. Side racks are built up over the truckbed to hold the load. Usually the wood is piled in three tiers, as illustrated. An attempt is being made to get the states to accept a 102-inch width for truck bodies. If this is done the wood can be piled across the truck, in two tiers. This will make loading, and especially unloading into railroad cars, much easier.

Logs are also carried on flat-bed trucks. Bunks are usually placed across the truckbed, to give firmer support to irregular logs, and to protect the truckbed from wear. Stakes are installed

in the sides of the truckbed; or hinged stakes at the ends of the bunks. (The use of hinged stakes with safety trip devices is described in Section 14, Loading.)

Stakes are generally preferable to cheese-blocks and chains for holding loads of short logs. Stake equipped trucks can be loaded and unloaded more quickly, especially with crane or jammer rigs (described in Section 14).

The cheese-block and chain arrangement is preferable, however, for loads of tree-length logs on truck-and-trailer combinations. Here the load is not built up so high as on a single vehicle. At the same time the load is subjected to greater side stresses, and the tightly chained load can take them better.



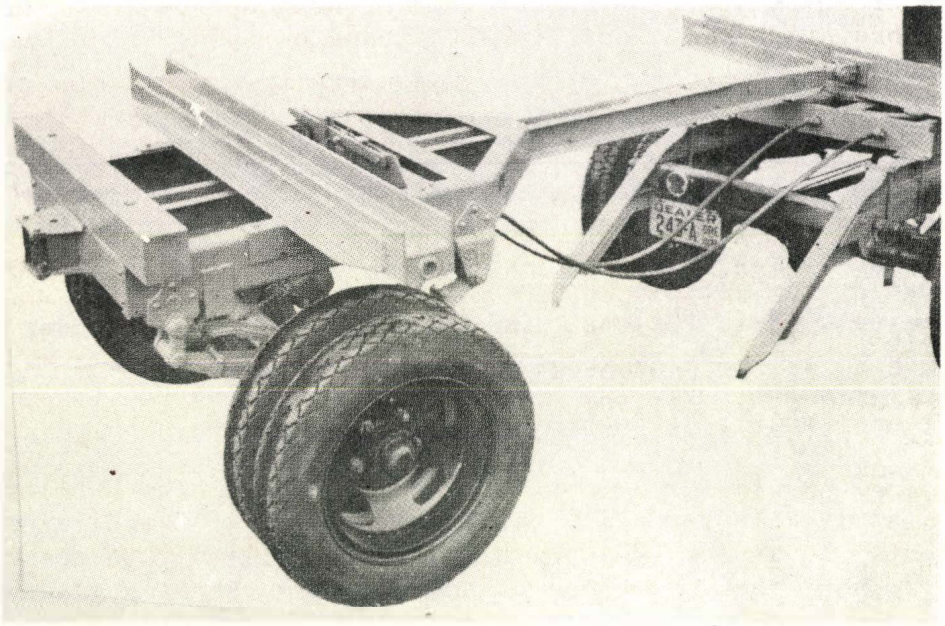
Cheese Block

Piggyback Loading

"Piggyback" loading is a good way for carrying the trailer on the return trip to the woods. Carrying the empty trailer on the truck saves wear and tear on the trailer, which otherwise would bounce around on the road. At the same time, it makes the truck more maneuverable, and safer to drive.

There are several ways of loading a trailer "piggyback". A ramp at the unloading point is one way: the trailer can be run up on it, uncoupled, and the truck can be backed under it. At the place where the logs are loaded in the woods, the trailer can be unloaded by the same crane that handles the logs.

A commercial device for "piggyback" loading is illustrated here. This rolls the trailer up onto the ramps and onto the rear of the truck. The operation is reversed to unload the trailer from the truck.



Truck Driving

The modern motor truck has been so much improved in recent years that it is much easier and safer to drive. Power brakes on all four or six wheels can be applied with very little effort. The number of square inches of tire tread on the road has been increased so that there is much less danger of skidding or spinning the wheels. Cabs have been made more comfortable and weather-tight, and steering has been made easier. Gear shifts have been made easier and more quiet, and two speed rear axles have multiplied the number of gears available. Helper springs, or progressive springs, have made riding easier, empty as well as loaded, and have reduced racking and bouncing strains on the vehicle. Further improvements are in prospect.

Nevertheless truck-driving is an art that demands a high type of worker -- sober, industrious, and alert. This is particularly true in logging work, where the truck driver must take heavy, bulky loads over a great variety of road surfaces, ranging from rough-graded woods roads, through paved highways, to crowded city streets. He is on his own much of the time.

Checking the Vehicle

The first requisite of a good logging-truck driver is that he know his vehicle, and that he make sure it is in shape to drive safely before he takes it out. If he is driving for a large company the maintenance of the vehicle may be the responsibility of the shop superintendent. Nevertheless, the driver should check it over before he takes it out, making sure that it has the proper amounts of gas, oil, and water; that the tires are in good condition and properly inflated; and that it is mechanically in good shape.

He should pay particular attention to the springs. The U-bolts, which clamp the springs to the axle, should be tight. If they are not, failure of spring leaves or the center bolt is very likely to occur. He should also note the deflection of the springs: For any given load the spring leaves should always deflect to the same position. If they do not, the spring may not be properly lubricated, one or more leaves may be broken, or the vehicle may be improperly loaded. When the springs sag , the frame may strike and bend the axle when the loaded truck rolls over a bump.

The driver should also check the steering mechanism, making sure there are no loose nuts or bent parts, and that the wheel has no more than the normal amount of play. A glance under the truck will show whether there are pools or spots of oil indicating leaks in the transmission, universal joints, differentials, or hubs. Flares, extinguishers, signals, tools, and chains should be in place.

In looking over his truck the driver should bear in mind that a new truck may have more of a tendency to loosen up than an older truck. Repeated tightening is usually necessary on a new truck until all clamping surfaces have become properly seated.

Loading

The logging-truck driver is usually responsible for the proper loading of his vehicle. This includes the amount of the load, and the way it is distributed and fastened. He must also consider the route to be traveled with the load, and he should note the road conditions he will

encounter, such as grades, underpass clearances, curves and switchbacks, and bridge limitations.

There is a constant pressure on the driver to carry the maximum loads possible; but this may be poor business in the long run. Carrying excessive weight on the back of a truck at low speeds over rough roads usually results in cracked or sprung frames and axles, and broken springs. Excessive gear work and heavy starting shorten the life of the transmission and clutch.

Excessive weight in the front end of the body will cause overloading of the front axle and will make steering more difficult. Excessive weight to the rear will lift weight from the front tires with resulting loss of steering control. From 15 to 20 percent of the gross load should be on the front axle. This is particularly true for tandem axle units. Any unit so heavily and unevenly loaded that it leans to one side is more likely to roll on curves. In such a case it may cause the wheel housings to rub on the tires, resulting in blowouts.

The load should also be tightly fastened, so it will not shift in transit.

Driving

Before putting the truck in gear it is a good idea to idle the motor, particularly in cold weather, until the water temperature in the cooling system reaches at least 140°. This will increase the life of the engine.

The clutch should be let in easily and steadily, with the transmission in the proper gear and the engine turning over at the proper rate. The clutch has to slip for a few seconds as it transfers the torque from the engine and flywheel to the driving wheels. Letting it out too suddenly strains the driving parts and sometimes breaks or cracks gears or snaps a shaft. Letting it out too slowly causes rapid wear on the clutch plate. Ordinarily a loaded vehicle should be started in its lowest gear, with the engine turning over at about half throttle or about 1,400 rpm. Only under the most extreme grade and load conditions should the engine be run up to its full governed speed before clutch engagement.

Then, smoothly and evenly, the truck should be brought to the proper gear for travel on the road, avoiding gear clashing and jerks or excessive slippage of the clutch. On most units double-clutching will save the gears in shifting. Double-clutching is usually particularly important when shifting to a lower gear. The driver must become familiar with the best engine speed to shift into each gear to minimize clashing.

The driver must rely on his own intelligence and driving ability to determine his speed and braking in accordance with whatever road traction problems arise. In going around curves the effect of speed is squared. This means that if a truck goes around a given curve at 60 miles an hour the force tending to upset it or make it skid sideways is nine times as much as it would be at 20 miles an hour on the same curve. Tires do not skid sideways as easily when driving power is being applied as they do with braking power applied. Every good driver approaches a curve in such a way that he can apply his accelerator safely while still on the curve.

The fact that very little effort is required to make brake applications with modern power brakes is apt to lead to excessive brake usage. Brakes should be applied in most cases at intermittent intervals to avoid excessive heating and full advantage should be taken of the braking power of the engine. In going down long steep grades it is good practice to put the truck in a low gear to utilize the braking power of the engine and then apply the brakes just enough to reduce the speed 4 or 5 miles an hour, then release the brakes and allow the speed to increase 4 or 5 miles an hour. Then repeat the cycle. Careful handling and good judgment are necessary in descending long steep grades with a heavy load to avoid severe brake overheating and loss of control of the truck. A recent invention, the hydrotarder, is being installed on many logging trucks to reduce the need for depending on the brakes to hold speed under control on such grades. It uses a fluid control unit installed on the drive shaft to keep the truck within a pre-set speed limit, and seems very effective.

When the vehicle is stopped the driver should not depend on the air or vacuum brakes to hold it for any length of time with the engine shut off. The pressure or vacuum is almost sure to leak slowly so that the brake is soon released. On level ground the hand brake can be used. On any grade it is well to leave the truck in gear and block the wheels.

Care of Tires

Proper tire care is an important part of good truck-driving. With the synthetic rubber tires, upon which we have had to depend in recent years, it has been particularly important. Synthetic tubes have been found to hold air much better than those made of natural rubber, but synthetic casings are particularly vulnerable to heat, and heat has destroyed many of them in a very short time. Flexing due to underinflation has been one of the major causes of such heat.

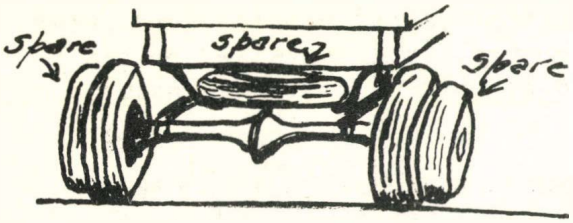
Both underinflation and overinflation are bad for tires. An overinflated tire, with the cords stretched tightly, is much more apt to be seriously

injured by a heavy impact, especially when the truck load is heavy. Properly inflated, the tire could have flexed to take the shock without injury.

An underinflated tire is too severely flexed in ordinary driving. The cords get hot, lose their strength, and eventually break. An overloaded tire is similarly flexed. A common and serious mistake is to try to offset the effect of overloading by overinflation, with the result noted in the paragraph above. Proper loading and proper inflation are essential to satisfactory tire life.

Rims too small for the tires are another cause of cord breakage. When a truck is equipped with oversized tires, the rims should also be changed to a larger size. If they are not, the beads of the tire will be squeezed close together, which pulls the tire out of shape and throws a strain on the sidewalls. Squeezing the beads together also reduces the air chamber, thus lowering the carrying capacity of the tire.

Tires on dual wheels should be carefully mated. If they are not, the larger tire will take most of the weight, and most of the wear. Ordinarily a new tire should not be mated with an old one on a dual wheel. Even new tires of different makes often have slightly different circumferences for the same rated size. The safest course is to put two tires of the same make and size on dual wheels. If it is necessary to mate a smaller tire with a larger one, carefully measure their circumferences when inflated, and put the larger one on the outside. A simple way to test whether or not one of a pair of duals is carrying the greater share of the load is to carefully inflate them to identical air pressure. At the end of a run, under load, check the pressures on the two tires. If one has gained in pressure more than the other that is a sign it has been carrying more than its share of the load. If a better-mated tire is not available the other tire can be inflated a little more, so that on the next trip both tires will be carrying the same weight.



Don't carry three spares!

The space between duals is important also. If it is too small there will be insufficient cooling air between the two tires, and when the truck is heavily loaded they may rub together. When oversized tires are put on, spacers often are needed between the hubs of the two wheels.

On the other hand, if there is too much space the outside tire may drag and scuff every time a turn is made.

Stone bruises and other sort of bulges in truck tires should be fixed as soon as possible. They will usually get worse with wear, and often result in blowouts and serious accidents.

There is much good information for the truck-driver in the operator's manual for the truck he is driving. He should study it carefully. Particularly important are the instructions for proper lubrication, engine speeds, oil pressure, and water temperatures. The manufacturer's directions for draining brake air-tanks will be found, and should be followed. The truck driver who becomes familiar with such instructions, and follows them, will be responsible for fewer delays to the job; and he may avoid having a serious accident.